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IS 4581 (1978): Phosphorus trichloride, pure and analytical reagent [CHD 1: Inorganic Chemicals]



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IS : 4581 - 1978

*Indian Standard*  
SPECIFICATION FOR  
PHOSPHORUS TRICHLORIDE, PURE AND  
ANALYTICAL REAGENT  
( *First Revision* )

UDC 661.638 : 54 - 4



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INDIAN STANDARDS INSTITUTION  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

Gr 4

Price Rs 7.40

July 1978

# Indian Standard

## SPECIFICATION FOR PHOSPHORUS TRICHLORIDE, PURE AND ANALYTICAL REAGENT ( First Revision )

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*Indian Standard*  
SPECIFICATION FOR  
PHOSPHORUS TRICHLORIDE, PURE AND  
ANALYTICAL REAGENT  
( *First Revision* )

**0. FOREWORD**

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 25 February 1978, after the draft finalized by the Alkalis and Chlorine Sectional Committee had been approved by the Chemical Division Council.

**0.2** This standard was first published in 1967. The Sectional Committee responsible for the preparation of this standard decided to revise it in order to include an additional method for the determination of phosphorus trichloride. Also in this revision the method of test for heavy metals has been modified to check the interference of heavy metals with copper. Potassium thiocyanate method for the determination of iron has been retained in addition to phenanthroline method.

**0.3** Phosphorus trichloride is used in the manufacture of synthetic organic chemicals, specially to replace the hydroxyl ( —OH ) group by chlorine. It is also used as a chlorinating agent and in the manufacture of saccharin.

**0.4** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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**1. SCOPE**

**1.1** This standard prescribes the requirements and the methods of sampling and test for phosphorus trichloride, pure and analytical reagent.

**2. GRADES**

- 2.1** The material shall have two grades, namely:
- a) *Grade 1* — analytical reagent, and
  - b) *Grade 2* — pure.

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\*Rules for rounding off numerical values ( *revised* ).

### 3. REQUIREMENTS

**3.1 Description** — The material shall be clear, colourless to light yellow, fuming liquid corresponding approximately in composition to  $\text{PCl}_3$ . It is soluble in most organic solvents like ether, benzene, carbon disulphide and carbon tetrachloride.

**3.2** The material shall also conform to the requirements laid down in Table 1, when tested in accordance with the methods prescribed in Appendix A and IS : 1448 [ P : 18 ]-1967\*.

**TABLE 1 REQUIREMENTS FOR PHOSPHORUS TRICHLORIDE**

( Clauses 3.2, A-5.2.1, A-6.3.2, A-7.2.5.1, B-4.2 and B-5.2 )

Sl. No.	CHARACTERISTIC	REQUIREMENT		METHOD OF TEST, REF TO	
		Grade 1	Grade 2	Appendix A	IS : 1448*
(1)	(2)	(3)	(4)	(5)	(6)
i)	Phosphorus trichloride, (as $\text{PCl}_3$ ), percent by mass, <i>Min</i>	99.0	96.0	A-2	—
ii)	Boiling range	Not less than 95 percent shall distill within the range of 75 to 76°C	Not less than 95 percent shall distill within the range of 75 to 78°C	—	P : 18
iii)	Relative density at 27°/27°C	1.550 to 1.580	1.550 to 1.580	A-3	—
iv)	Evaporation residue, including $\text{PCl}_5$ , percent by mass, <i>Max</i>	0.5	0.5	A-4	—
v)	Sulphate (as $\text{SO}_4$ ), percent by mass, <i>Max</i>	0.001	—	A-5	—
vi)	Heavy metals (as Pb), percent by mass, <i>Max</i>	0.001	—	A-6	—
vii)	Iron (as Fe), percent by mass, <i>Max</i>	0.000 5	—	A-7	—

\*Methods of test for petroleum and its products, P : 18 Distillation (*first revision*).

### 4. PACKING AND MARKING

**4.1 Packing** — The material shall be packed in lead-coated steel containers or in glass bottles or kept tightly closed.

NOTE — It decomposes on coming in contact with water or even moist air.

\*Methods of test for petroleum and its products, P : 18 Distillation (*first revision*).



**4.2 Marking** — The containers shall be marked with the name and grade of the material; name of the manufacturer and recognized trade-mark, if any; net mass and batch number. The word 'Poisonous' together with symbol as given in Fig. 15 of IS : 1260 ( Part I )-1973\* shall also be given on the label. The label shall have a note as follows :

CAUTION : Phosphorus trichloride is highly corrosive. When mixed with water, it decomposes with evolution of heat.

**4.2.1** The containers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

## 5. SAMPLING

**5.1** Representative samples of the material shall be drawn and the criteria for conformity shall be determined in accordance with the method prescribed in Appendix B.

# APPENDIX A

( Clause 3.2, and Table 1 )

## METHODS OF TEST FOR PHOSPHORUS TRICHLORIDE

### A-1. QUALITY OF REAGENTS

**A-1.1** Unless specified otherwise, pure chemicals and distilled water ( see IS : 1070-1977† ) shall be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

### A-2. DETERMINATION OF PHOSPHORUS TRICHLORIDE

**A-2.0 General** — Two methods for determination of phosphorus trichloride are given. Method A shall be the referee method, to be used in case of dispute.

\*Pictorial markings for handling and labelling of goods: Part I Dangerous goods ( first revision ).

†Specification for water, for general laboratory use ( second revision ).

## A-2.1 Method A

### A-2.1.1 Reagents

**A-2.1.1.1 Ammonium borate solution** — Dissolve 20 g of boric acid in 170 ml of 10 percent ammonia solution and make up the volume to 1 000 ml.

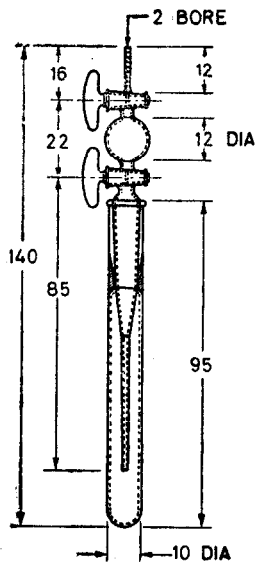
**A-2.1.1.2 Dilute hydrochloric acid** — approximately 2 N.

**A-2.1.1.3 Iodine solution** — 0.1 N.

**A-2.1.1.4 Standard sodium thiosulphate solution** — 0.1 N (see IS : 2316-1968\*).

**A-2.1.1.5 Starch solution** — 1 percent (m/v).

**A-2.1.2 Procedure** — Weigh accurately with the aid of Lunge-Rey pipette (see Fig. 1) about 3 g of the material into a 500-ml graduated flask containing about 300 ml of water. Cool, dilute to volume and mix thoroughly. Transfer 10 ml of this solution into a 300 ml conical flask, add 50 ml of water and 30 ml of 0.1 N iodine solution. Add 25 ml of ammonium borate solution and allow to stand in a dark place for 30 minutes. Acidify with 20 ml of 2 N hydrochloric acid and titrate back the excess iodine with 0.1 N sodium thiosulphate solution, using 5 ml of starch indicator solution towards the end of the titration.



All dimensions in millimetres.

FIG. 1 LUNGE-REY PIPETTE

\*Methods of preparation of standard solutions for colorimetric and volumetric analysis.

**A-2.1.3 Calculation**

$$\begin{array}{l} \text{Phosphorus trichloride (as } \text{PCl}_3 \text{),} \\ \text{percent by mass} \end{array} = \frac{(30 - V) \times 34.335}{M}$$

where

$V$  = volume in ml of standard sodium thiosulphate solution consumed, and

$M$  = mass in g of material taken for test.

**A-2.2 Method B****A-2.2.1 Reagents**

**A-2.2.1.1 Sodium bicarbonate** — A.R. grade (see IS : 2124-1974\*).

**A-2.2.1.2 Iodine solution** — 0.1 N.

**A-2.2.1.3 Standard sodium thiosulphate solution** — 0.1 N (see IS : 2316-1968†).

**A-2.2.1.4 Starch solution** — 1 percent ( $m/v$ ).

**A-2.2.2 Procedure** — Accurately weigh about 10 g of sample in a dry weighing bottle. Transfer it quantitatively to 1 000-ml volumetric flask containing about 600 ml of ice cold water. Dissolve the material completely. Dilute to the mark with cold water and mix well.

**A-2.2.2.1** Pipette 20 ml of the above solution into a 500-ml iodine flask. Add 2 g of sodium bicarbonate and 50 ml of standard iodine solution. Shake well and allow to stand for at least half an hour with occasional shaking. Back titrate the excess iodine with standard sodium thiosulphate solution using starch solution as indicator.

**A-2.2.3 Calculation**

$$\begin{array}{l} \text{Phosphorus trichloride (as } \text{PCl}_3 \text{),} \\ \text{percent by mass} \end{array} = \frac{343.4 \times V \times N}{M}$$

where

$V$  = volume in ml of standard sodium thiosulphate solution consumed,

$N$  = normality of standard sodium thiosulphate solution, and

$M$  = mass of the material taken for the test.

\*Specification for sodium bicarbonate (first revision).

†Methods of preparation of standard solutions for colorimetric and volumetric analysis.

### A-3. DETERMINATION OF RELATIVE DENSITY

**A-3.0 Outline of the Method** — The sample is brought to the prescribed temperature and transferred to a cylinder at approximately the same temperature. The appropriate hydrometer is lowered into the sample and allowed to settle. The hydrometer is read and the temperature of the sample noted.

#### A-3.1 Apparatus

**A-3.1.1 Relative Density Hydrometer** — of a suitable range.

**A-3.1.2 Hydrometer Cylinders** — of clear glass or plastics, with lip for convenience of pouring, and having an inside diameter at least 25 mm greater than the outside diameter of the hydrometer used. The height of the cylinder shall be such that the hydrometer floats in the sample with at least 25 mm clearance between the bottom of the hydrometer and the bottom of the cylinder.

**A-3.1.3 Thermometer** — of a 0 to 50°C range (see schedule mark 3 of IS : 2480-1973\* ).

**A-3.1.4 Constant Temperature Bath**

#### A-3.2 Procedure

**A-3.2.1** Adjust the temperature of the sample to be tested to 27°C and bring the hydrometer cylinder and thermometer to approximately that temperature. Pour the sample into the clean hydrometer cylinder without splashing in order to avoid the formation of bubbles and to reduce to a minimum the evaporation of the sample. Remove any air bubbles formed before inserting the hydrometer.

**A-3.2.2** Place the cylinder containing the sample in a fume hood. Ensure that the temperature of the sample does not change during the test by keeping the cylinder in a constant temperature bath. Lower the hydrometer gently into the sample and when it has settled, determine the temperature of the sample which is thoroughly but cautiously stirred with the thermometer, the whole of the mercury thread being immersed. Remove the thermometer and allow the hydrometer to resettle. Depress it about two scale divisions into the liquid and then release it. Keep the portion of the stem above the level of the liquid dry, since failure to do this changes the effective mass of the instrument and thus affects the accuracy of the reading. Allow sufficient time for the hydrometer to come to rest and for all air bubbles to come to the surface.

**A-3.2.3** When the hydrometer has come to rest, floating freely away from the walls of the cylinder, and the temperature of the sample is

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\*Specification for solid stem general purposes glass thermometers (*first revision*).

constant, read the hydrometer to the nearest 0.000 5. The correct hydrometer reading is that point on the hydrometer scale at which the surface of the liquid cuts the scale. If a standard certificate is provided, correct the hydrometer reading according to the data thereon. Report the value so obtained, to the nearest 0.001 as the specific gravity at 27°/27°C.

## A-4. DETERMINATION OF RESIDUE ON EVAPORATION

### A-4.1 Apparatus

**A-4.1.1 Platinum or Silica Basin** — 75 mm in diameter, 20 mm deep.

**A-4.2 Procedure** — Weigh accurately with the aid of Lunge-Rey pipette, about 3 g of the material into a weighed platinum or silica dish and evaporate to dryness on a steam bath or other suitable heating device in a fume hood. Dry the residue in an oven maintained at  $105 \pm 2^\circ\text{C}$  for 20 minutes. Cool in a desiccator and weigh.

### A-4.3 Calculation

$$\text{Evaporation residue, percent by mass} = \frac{100 m}{M}$$

where

$m$  = mass in g of the residue, and

$M$  = mass in g of the sample taken for the test.

## A-5. TEST FOR SULPHATE

### A-5.1 Reagents

**A-5.1.1 Dilute Ammonium Hydroxide Solution** — approximately 2 N.

**A-5.1.2 Concentrated Hydrochloric Acid** — conforming to IS : 265-1976\*.

**A-5.1.3 Barium Chloride Solution** — Dissolve 12 g of barium chloride crystals in sufficient water and dilute to 100 ml.

**A-5.1.4 Congo Red Indicator** — Dissolve 0.1 g of congo red in 10 ml of rectified spirit ( see IS : 323-1959† ) and dilute to 100 ml with water.

**A-5.2 Procedure** — Dissolve cautiously 2.0 ml of the material in 75 ml of water, and make the solution just alkaline to congo red with ammonium hydroxide. Add 2 ml of hydrochloric acid, heat to boiling and add 5 ml of barium chloride solution.

**A-5.2.1** The material shall be taken as not having exceeded the limit given in Table 1 if no turbidity is produced in 5 minutes.

\*Specification for hydrochloric acid ( second revision ).

†Specification for rectified spirit ( revised ).

## A-6. TEST FOR HEAVY METALS

### A-6.1 Apparatus

A-6.1.1 *Nessler Cylinders* — 50 ml capacity.

### A-6.2 Reagents

A-6.2.1 *Concentrated Nitric Acid* — conforming to IS : 264-1976\*.

A-6.2.2 *Dilute Hydrochloric Acid* — 10 percent (*v/v*).

A-6.2.3 *Sodium Acetate*

A-6.2.4 *Potassium Cyanide Solution* — 10 percent (*m/v*).

A-6.2.5 *Hydrogen Sulphide Solution* — saturated and freshly prepared in water.

A-6.2.6 *Standard Lead Solution* — Dissolve 1.600 g of lead nitrate in water and make up the solution 1 000 ml with water. Dilute 10 ml of the solution to 1 000 ml with water. One millilitre of this solution contains 0.01 mg of lead (as Pb).

A-6.3 **Procedure** — Weigh accurately with the aid of a Lunge-Rey pipette 3.000 g of the sample into a small beaker and dilute with about 30 ml of water. Add 2 ml of concentrated nitric acid, boil the solution gently for 10 minutes, cool, and dilute to 50 ml in a volumetric flask.

A-6.3.1 To 5 ml of the prepared solution of the material (*see A-6.3*) contained in a Nessler cylinder, add 0.6 ml of standard lead solution, 7 ml of dilute hydrochloric acid, 4 g of sodium acetate and few drops of potassium cyanide solution. Dilute the contents to 40 ml with water. To 15 ml of the prepared solution contained in another Nessler cylinder, add 4 g of sodium acetate, a few drops of potassium cyanide solution and dilute to 40 ml. Then to each add 10 ml of hydrogen sulphide solution and mix.

A-6.3.2 The limit prescribed in Table 1 shall be taken as not having been exceeded if the intensity of colour produced with the material is not greater than that produced with the standard solution.

## A-7. TEST FOR IRON

A-7.0 **General** — Two methods are prescribed. In case of dispute, the spectrophotometric method shall be used.

### A-7.1 Spectrophotometric Method

A-7.1.0 *General* — Ferrous iron reacts with *o*-phenanthroline between pH 3 and 9 in the ratio 1 : 3 to give a stable, orange-red coloured complex

\*Specification for nitric acid (*second revision*).

which has maximum absorbance at 510 nm. Silver and bismuth give precipitates. Copper, cadmium, mercury and zinc reduce the intensity of the colour. The effect of these ions can be overcome by using excess reagent.

#### **A-7.1.1 Apparatus** — Spectrophotometer.

#### **A-7.1.2 Reagents**

**A-7.1.2.1 Standard iron solution** — Dissolve 7.02 g of ferrous ammonium sulphate  $[\text{FeSO}_4 (\text{NH}_4)_2 \text{SO}_4 \cdot 6\text{H}_2\text{O}]$  in water containing 10 ml of concentrated sulphuric acid and dilute with water to 1 000 ml. One millilitre of this solution contains 1.0 mg of iron (as Fe). It may be diluted suitably to contain 10, 25 or 100  $\mu\text{g}$  of iron per millilitre.

**A-7.1.2.2 Hydroxylamine hydrochloride solution** — Dissolve 10 g in water and dilute to 100 ml. This solution should be freshly prepared.

**A-7.1.2.3 o-Phenanthroline solution** — Dissolve 0.1 g of o-phenanthroline in 50 ml of ethyl alcohol and dilute to 100 ml with water. Mix well and store in a dark bottle with a ground-glass stopper.

**A-7.1.2.4 Sodium acetate — acetic acid buffer solution** — Dissolve 28 g of glacial acetic acid in water and dilute to 500 ml. Similarly dissolve 68 g of sodium acetate in 500 ml of water. At the time of use, prepare the required quantity of buffer solution by mixing equal volumes of the two solutions.

**A-7.1.2.5 Dilute sulphuric acid** — approximately 4 N.

**A-7.1.2.6 Dilute ammonium hydroxide**

**A-7.1.3 Preparation of Standard Graph** — Take 5 ml of standard iron solution (10  $\mu\text{g}/\text{ml}$ ) into a 100 ml beaker. Add 10 ml of water, 1 ml of hydroxylamine hydrochloride solution, 1 ml of dilute sulphuric acid and 5 ml of orthophenanthroline solution. Add sufficient ammonia solution to adjust the pH of the solution to 5 and then add 5 ml of buffer solution. Adjust the pH to 5 again (if necessary). Transfer the contents to a 100 ml volumetric flask and dilute to the mark with water. Keep aside the flask for 30 minutes to develop red colour fully. This solution corresponds to iron concentration of 0.05  $\text{mg}/100 \text{ ml}$ . Determine the optical density of this solution on the spectrophotometer at 510 nm. Similarly prepare solutions of iron concentrations 0.10 mg, 0.15 mg, 0.20 mg, 0.25 mg and 0.30 mg per 100 ml. Determine optical densities of these solutions and plot a graph of concentrations against corresponding optical densities.

**A-7.1.4 Procedure** — Weigh accurately 10 g of the material and transfer into a one-litre conical flask. Add 150 ml of water and sufficient hydrochloric acid to dissolve the sample. When effervescence ceases, boil the contents to evolve out the carbon dioxide. Cool to room temperature and

dilute to 250 ml in a volumetric flask. Take 25 ml of the solution in a 100 ml beaker, add 1 ml of hydroxylamine hydrochloride solution and 5 ml of orthophenanthroline solution. Adjust the pH of the solution to 5 and then add 5 ml of buffer solution. Adjust the pH to 5 again (if necessary) and dilute to the mark with water. Keep the contents for 30 minutes to develop the red colour fully and then determine the optical density on the spectrophotometer at 510 nm. From the standard graph, read the corresponding concentration of iron per 100 ml of the solution.

#### A-7.1.4.1 Calculation

$$\text{Iron content, percent by mass} = \frac{c \times d \times 100}{M}$$

where

$c$  = concentration of iron in mg per 100 ml of the sample solution,

$d$  = dilution factor, and

$M$  = mass in mg of the sample taken for analysis.

NOTE — If the sample solution is strongly red coloured suitably less volumes, namely, 5 ml or 10 ml may be taken for analysis.

### A-7.2 Colorimetric Method

#### A-7.2.1 Apparatus

A-7.2.1.1 Nessler cylinders — 50 ml capacity.

#### A-7.2.2 Reagents

A-7.2.2.1 Concentrated hydrochloric acid — conforming to IS : 265-1976\*.

A-7.2.2.2 Ammonium persulphate

A-7.2.3 Butanolic Potassium Thiocyanate — Dissolve 10 g of potassium thiocyanate in 10 ml of water. Add sufficient n-butanol to make up to 100 ml and shake vigorously until the solution is clear.

A-7.2.4 Standard Iron Solution — Dissolve 0.702 g of ferrous ammonium sulphate  $[\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}]$  in 10 ml of dilute sulphuric acid [10 percent (v/v)] and dilute with water to 1 000 ml. Dilute 10 ml of this solution to 1 000 ml. One millilitre of the diluted solution is equivalent to 0.001 mg of iron (as Fe).

A-7.2.5 Procedure — To 5 ml of the prepared solution of the material (see A-6.3), add 1 ml of hydrochloric acid and about 50 mg of ammonium persulphate, and dilute to 15 ml. Completely transfer the solution to a separatory funnel, add 15 ml of butanolic potassium thiocyanate and

\*Specification for hydrochloric acid (second revision).



shake for 30 seconds. Then transfer the contents to Nessler cylinder. Carry out a control test with 1.5 ml of standard iron solution, dilute to 15 ml, add 1 ml of hydrochloric acid, about 50 mg of ammonium persulphate, 15 ml of butanolic potassium thiocyanate and shake for 30 seconds. Transfer the contents to a Nessler cylinder.

**A-7.2.5.1** The limit prescribed in Table 1 shall be taken as not having been exceeded if the intensity of red colour in the clear butanolic layer (upper) produced in the test with the material is not greater than that produced in the control test.

## APPENDIX B

( Clause 5.1 )

### SAMPLING OF PHOSPHORUS TRICHLORIDE

#### B-1. GENERAL REQUIREMENTS OF SAMPLING

**B-1.0** In drawing, storing, preparing and handling test samples the precautions given in **B-1.1** to **B-1.5** shall be observed.

**B-1.1** Samples shall not be taken at a place exposed to weather.

**B-1.2** Precautions shall be taken to protect the samples, the sampling instrument and the containers for samples from adventitious contamination.

**B-1.3** To draw a representative sample, the contents of each container selected for sampling shall be mixed thoroughly by suitable means.

**B-1.4** The samples shall be placed in suitable, clean, dry and air-tight containers.

**B-1.5** Each sample container shall be sealed air-tight after filling and marked with full details of sampling, the date of sampling and the year of manufacture.

#### B-2. SCALE OF SAMPLING

**B-2.1 Lot** — All the containers in a single consignment of phosphorus trichloride of the same grade drawn from a single batch of manufacture shall constitute a lot. If the consignment is declared to consist of different batches, the batches shall be marked separately and the group of containers in each batch shall constitute separate lots.

**B-2.2** The number of containers ( $n$ ) to be selected from the lot shall depend upon the size of the lot ( $N$ ) and shall be in accordance with Table 2.

TABLE 2 NUMBER OF CONTAINERS TO BE SELECTED

LOT SIZE ( $N$ )	NUMBER OF CONTAINERS TO BE SELECTED ( $n$ )
Up to 50	3
51 to 100	4
101 to 150	5
151 to 300	7
301 and above	10

**B-2.3** These containers shall be selected at random from the lot and in order to ensure the randomness of selection procedures given in IS: 4905-1968\* may be followed.

**B-2.4** Samples shall be tested for each lot for ascertaining conformity of the material to the requirements of the specification.

### B-3. PREPARATION OF TEST SAMPLES

**B-3.1** From each of the containers selected according to **B-2.3**, a portion of the liquid about 200 ml shall be drawn with the help of a suitable sampling instrument.

**B-3.2** Out of these portions drawn from each container, equal quantities of liquid shall be taken and mixed thoroughly to form a composite sample of 600 ml. The composite sample shall be divided into three parts, one for the purchaser, another for the supplier and the third used as a referee sample.

**B-3.3** The remaining portion of the liquid drawn from each container shall be divided into three equal parts each forming an individual sample. One set of individual samples representing  $n$  containers sampled shall be marked for the purchaser, another for the supplier and the third used as a referee sample.

**B-3.4** All the individual samples and the composite sample shall be transferred to separate sample containers. All the containers shall be sealed and labelled with full identification particulars.

**B-3.5** The referee test samples consisting of a composite sample and a set of individual samples shall bear the seal of both the purchaser and the supplier. They shall be kept at a place agreed to between the purchaser and the supplier to be used in case of dispute between the two.

\*Methods for random sampling.

**B-4. NUMBER OF TESTS**

**B-4.1** For both the grades of phosphorus trichloride, tests for the determination of phosphorus trichloride ( $\text{PCl}_3$ ) content shall be performed on each of the individual samples.

**B-4.2** Tests for the determination of all other characteristics given in Table 1 shall be performed on composite sample.

**B-5. CRITERIA FOR CONFORMITY**

**B-5.1 For Individual Samples** — From the test results for phosphorus trichloride content the average ( $\bar{X}$ ) and the range ( $\bar{R}$ ) of test results shall be computed (range being defined as the difference between the maximum and the minimum of the test results).

The appropriate expression as shown in col 5 of Table 3 shall be calculated for this characteristic. If the values of the expressions satisfy the conditions given in col 5 of Table 3, the lot shall be declared to have satisfied the requirement for phosphorus trichloride content.

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**TABLE 3 CRITERIA FOR CONFORMITY FOR PHOSPHORUS TRICHLORIDE CONTENT**

SL No.	GRADE	AVERAGE OF TEST RESULTS 1, 2, 3, . . . . n	RANGE	CRITERION FOR CONFORMITY
(1)	(2)	(3)	(4)	(5)
i)	1	$\bar{X}_1$	$R_1$	$(\bar{X}_1 - 0.6 R_1)$ shall be greater than or equal to 99.0
ii)	2	$\bar{X}_2$	$R_2$	$(\bar{X}_2 - 0.6 R_2)$ shall be greater than or equal to 96.0

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**B-5.2 For Composite Sample** — The lot shall be deemed to have met the requirements of the other characteristics tested on the composite test sample if the test results satisfy the corresponding requirements given in Table 1.

**B-5.3** The lot shall be considered as conforming to the specification if it satisfies the criteria given in **B-5.1** and **B-5.2**.

**INDIAN STANDARDS**  
**ON**  
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IS :

- 251-1972 Soda ash, technical (*second revision*)
- 252-1973 Caustic soda, pure and technical (*amalgamated revision* of IS: 252-1962 and IS: 1021-1964)
- 253-1970 Edible common salt (*amalgamated revision* of IS: 253-1964, IS: 1845-1964 and IS: 2035-1961)
- 254-1973 Magnesium chloride (*second revision*)
- 296-1974 Sodium carbonate, anhydrous (*second revision*)
- 376-1976 Sodium hydroxide, analytical reagent (*second revision*)
- 593-1964 Salt for hide-curing (wet-salting) (*revised*)
- 594-1962 Common salt for fish curing (*revised*)
- 646-1970 Liquid chlorine, technical (*first revision*)
- 701-1966 Zinc chloride (*revised*)
- 708-1970 Potassium chloride, technical (*first revision*)
- 711-1970 Ferric chloride, technical (*first revision*)
- 797-1976 Common salt for chemical industries (*second revision*)
- 1065-1971 Bleaching powder, stable (*first revision*)
- 1314-1967 Calcium chloride (*first revision*)
- 1514-1959 Methods of sampling and test for quick lime and hydrated lime
- 1540 (Part I)-1967 Quick lime and hydrated lime for chemical industries: Part I Quick lime (*first revision*)
- 1540 (Part II)-1970 Quick lime and hydrated lime for chemical industries: Part II Hydrated lime (*first revision*)
- 1744-1970 Stannic chloride, anhydrous, technical (*first revision*)
- 2124-1974 Sodium bicarbonate (*revised*)
- 2142-1974 Bromine, technical (*revised*)
- 2697-1976 Ammonium bicarbonate for food industry (*first revision*)
- 2723-1964 Ammonium bromide, pure and analytical reagent
- 2780-1964 Sodium bromide, pure
- 2797-1964 Potassium bromide
- 4150-1967 Potassium chloride, technical (*first revision*)
- 4408-1967 Sodium chloride, analytical reagent
- 4581-1978 Phosphorus trichloride, pure and analytical reagent (*first revision*)
- 5301-1969 Sodium chlorate
- 5316-1969 Ammonium carbonate
- 6135-1971 Soda ash, fused, technical
- 6155-1971 Sodium carbonate, monohydrate
- 6614-1972 Aluminium chloride anhydrous, technical
- 6831-1973 Caustic potash, technical and analytical
- 7129-1973 Potassium carbonate, anhydrous
- 7130-1973 Chlorosulphonic acid, technical
- 7163-1973 Potassium iodide, pure and analytical reagent
- 7223-1973 Potassium chloride, analytical reagent
- 7224-1973 Iodized salt

# INTERNATIONAL SYSTEM OF UNITS ( SI UNITS )

## Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

## Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

## Derived Units

Quantity	Unit	Symbol	Conversion
Force	newton	N	1 N = 0.101972 Kgf
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m <sup>2</sup>
Frequency	hertz	Hz	1 Hz = 1 c/s ( s <sup>-1</sup> )
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m <sup>2</sup>

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